PANIMALAR ENGINEERING COLLEGE

An Autonomous Institution

[JAISAKTHI EDUCATIONAL TRUST]

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Bangalore Trunk Road,Varadharajapuram, Poonamallee, Chennai- 600 123

INDIA'S WOMEN CENTRIC NATIONAL LEVEL 24 – HOUR HACKATHON
TECHDIVATHON – 2.0
She blooms. She leads. She conquers

Domain: WIRELESS COMMUNICATION

Problem Statements:

S.No	Title	Problem Statement	Description
1	Energy Harvesting Wireless Sensor Nodes	Battery-powered sensors limit deployments in remote locations.	Develop sensor nodes that harvest energy from ambient sources (solar, RF, vibration) to enable maintenance-free wireless sensing in harsh environments.
2	AI-Assisted Spectrum Sharing Protocol	Growing device density leads to crowded wireless channels.	Design an AI-driven protocol that dynamically negotiates spectrum sharing for minimal interference among competing wireless users.
3	Holographic Radio for Immersive Telepresence	Current wireless links struggle to deliver lifelike telepresence with depth and spatial audio.	Design a holographic radio system that combines multi-antenna beamforming and synchronized multi-channel streams to support 3D video, volumetric avatars, and spatial audio for next-gen remote presence experiences.
4	Secure Underwater Wireless Communication	Subsea devices struggle with unreliable, insecure links.	Invent a robust and secure underwater wireless comms protocol for sensor/robot networks spanning ocean monitoring, defense, and oil/gas.
5	Adaptive Vehicular V2X Edge Network	Urban mobility needs resilient vehicle-to-everything (V2X) comms.	Build an edge-powered wireless mesh to support real-time data exchange between vehicles, infrastructure, and pedestrians for smart cities.
6	AI-Based Wireless Anomaly Detection	Legacy wireless monitoring fails to catch new threats/attacks.	Develop a cloud service using AI/ML to continuously scan multi-band wireless environments, flagging malicious actors or anomalous traffic.
7	Intelligent Satellite-to-Cell Communication	Remote regions and disaster zones lack robust cellular coverage.	Design a solution leveraging the latest satellite-to-cellular technology to automatically switch user devices from terrestrial to satellite networks seamlessly.
8	Distributed Mesh for Smart Agriculture	Farms need resilient, large-area connectivity for IoT devices.	Create a self-healing wireless mesh network for agricultural sensors, actuators, and drones, with dynamic bandwidth allocation and local processing.

9	Contactless Wireless Payment Wearables	Traditional contactless payments remain phone or card-based.	Invent lightweight, energy-efficient wearables for secure contactless payments using UWB/NFC with biometric verification, for all age groups.
10	Environmental RF Sensing for Smart Cities	Wireless networks lack contextual awareness of their environment.	Build a citywide sensor system using passive RF reflections to monitor environmental changes, traffic flow, or human activity without privacy risk.
11	Cognitive 6G Smart Antenna Array	Next-gen networks require intelligent, reconfigurable PHY layers.	Propose an antenna array for 6G with embedded AI that can autonomously optimize beamforming, polarization, and power for channel conditions.
12	IoT Device Coordination in Dense Environments	Device congestion causes packet loss/interference at scale events.	Develop a protocol for high-density IoT deployments (stadiums, expos) to coordinate spectrum access and minimize packet collisions.
13	Wireless Health Data Transfer for Ambulances	Patient care is limited by lack of real-time hospital data syncing.	Design a secure, mobile wireless backhaul for ambulances that streams live patient telemetry directly to ER staff en route.
14	Airborne Wireless Edge Cloud for Events	Large festivals and sports events overload fixed wireless infrastructure.	Develop a fleet of tethered balloons or drones acting as an aerial edge cloud, providing temporary high-capacity wireless coverage and local compute for AR, streaming, and analytics during massive events.
15	Next-Gen Smart Building Automation with Wi-Fi Sensing	Existing IoT in buildings does not capture movement/usage context.	Design a system leveraging Wi-Fi signal fluctuations for presence detection, security, and resource optimization within smart buildings.
16	Privacy-Focused Personal Wireless Area Networks	Current standards expose user location/behavior.	Create an open standard for short-range personal wireless that uses one-time addresses and encrypted handshakes to hide user metadata.
17	Multi-Hop LPWAN for Wildlife Corridors	Tracking animal migrations across vast areas is unreliable.	Build a multi-hop low-power wide-area network to support wildlife-tracking sensors over national parks or international corridors.
18	Blockchain-Powered Wireless Roaming Settlement	Global device roaming billing is slow and non-transparent.	Design a blockchain solution that instantly settles wireless roaming charges across carriers worldwide, enabling seamless, real-time service activation.
19	Automated Spectrum Compliance Monitor for Enterprises	Many corporate wireless deployments violate national regulations.	Develop a turnkey device to automatically scan, log, and enforce regulatory spectrum boundaries for enterprise wireless networks.
20	Ultra-Low Latency Wireless for Remote Surgery	Telesurgery needs guaranteed, minimal-latency links.	Invent a wireless solution with QoS and fallback redundancy to enable safe, sub-5ms latency control in remote surgical applications.
21	Secure Wireless Industrial Robot Control	Wireless robot control is susceptible to jamming and spoofing.	Build a protocol with anomaly detection and multifactor authentication for secure, real-time wireless robot control in industrial automation

22	eSIM-Based Emergency Communication Wearable	Not all citizens have access to sturdy emergency alert devices.	Design a rugged wearable that uses eSIM to connect to any available wireless network globally in disaster scenarios, working regardless of country
23	Vehicle Platooning Mesh for Freight Automation	Autonomous trucks need constant, local comms for platooning.	Implement a purpose-built, adaptive mesh network for tightly grouped freight vehicles, supporting high-speed convoy automation.
24	Wireless Power Transfer Management Dashboard	Wireless charging deployments lack management transparency.	Develop a dashboard for monitoring efficiency, usage, and diagnostics of public or enterprise wireless power transfer points.
25	Ambient Backscatter Tag Network	Cheap, batteryless sensing is difficult for mass IoT.	Create a network enabling batteryless tags to communicate via ambient backscatter, supporting large-scale, ultra-low-cost sensor deployments.
26	Call Drop Diagnosis Assistant	Rural villagers face frequent call drops but telecom providers cannot pinpoint the cause.	Create a lightweight edge application that analyzes signal strength, device parameters, network type, and tower proximity to diagnose root causes of call drops and provide actionable fixes or escalation insights to users and operators.
27	Edge-Based Emergency Alert System	In road-accident scenarios, delays in alerting authorities cost lives.	Build a 5G edge-enabled system that uses mobile and vehicle sensors to detect crash events and automatically send location, severity, and event type to the nearest emergency control center in under 10 seconds for rapid response.

Reviewer's Digital Signature

Reviewer's Name:
Position:
Organization:
Date:

Digital Signature: